DOCUMENT RESUME

ED 273 668 TM 860 518

AUTHOR Warries, Egbert
TITLE Implications of Three Recently Completed IEA Studies for Teaching and Teacher Education in The Netherlands.
PUB DATE Apr 86
NOTE 17p.; Paper presented at the Annual Meeting of the American Educational Research Association (67th, San Francisco, CA, April 16-20, 1986).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; Classroom Environment; Effect Size; Foreign Countries; *Inservice Teacher Education; Interviews; Junior High Schools; Mathematics Education; Observation; Questionnaires; *School Organization; Science Education; *Student Participation; *Teacher Behavior; *Teaching Methods; Textbook Evaluation
IDENTIFIERS International Assn Evaluation Educ Achievement; *Netherlands

ABSTRACT

The paper gives Dutch results and possible implications of three recently completed international evaluation studies. School subjects were mathematics and science at the grade levels 8 and 9 in more than 500 schools. Effect and efficiency of teaching and textbooks in different school types, opportunity to learn, and students' classroom participation were studied. Results of a subsequent experiment involving training for teacher management and instructional behavior are reported. Data collection was by means of observations of eight lessons per teacher, tests and questionnaires for teachers and students. The training course was highly successful, with effect-sizes from .47 to 3.50. Recommendations for teacher training are given. (Author/JAZ)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

"ORIGINAL"

IMPLICATIONS OF THREE RECENTLY COMPLETED IEA STUDIES FOR TEACHING AND TEACHER EDUCATION IN THE NETHERLANDS

ED273668

Egbert Warries

Department of Education
Twente University
Enschede, The Netherlands

Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, California, April 1986.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

E. Warries

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

TM 860 518

Abstract

The paper gives Dutch results and possible implications of three recently completed international evaluation studies. School subjects were Mathematics and Science, at the grade levels 8 and 9 in more than 500 schools. Effect and efficiency of teaching and textbooks in different school types were calculated, as well as the effect of opportunity to learn and students' participation during class on achievement. Results of a subsequent experiment involving training for teacher management and instructional behavior are reported. Data collection was by means of observations of eight lessons per teacher, tests and questionnaires for teachers and students. The training course was highly succesful, with effect-sizes from .47 to 3.50. Recommendations for teacher training are given.

IMPLICATIONS OF THREE RECENTLY COMPLETED IEA STUDIES FOR TEACHING AND TEACHER EDUCATION IN THE NETHERLANDS

Egbert Warries

Twente University

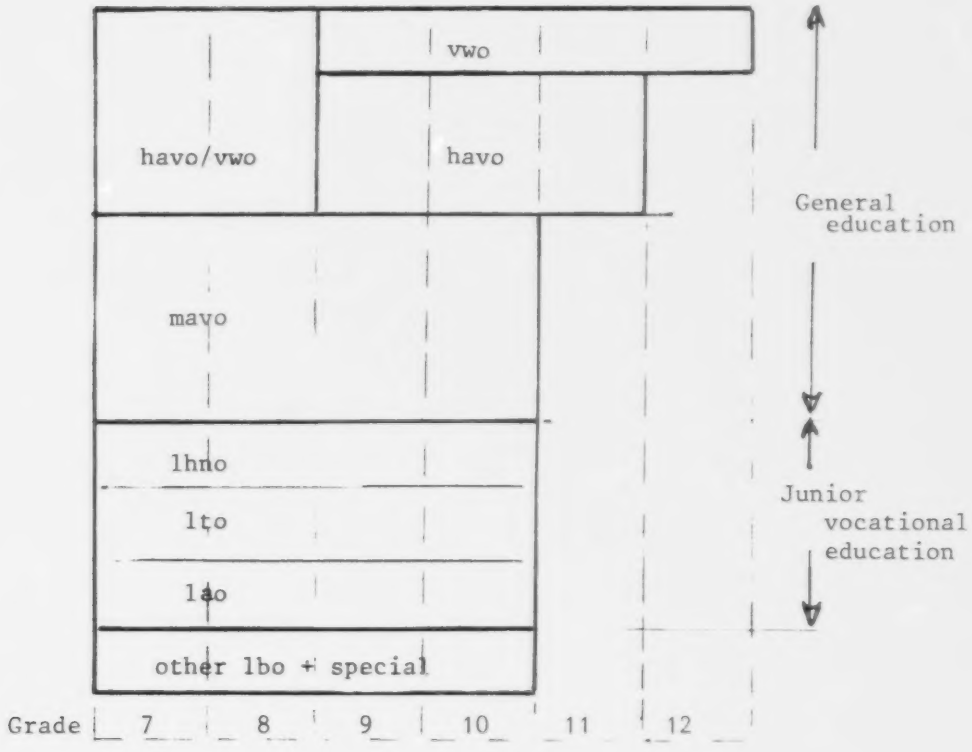
Introduction

Background of the IEA work Reported on

In this paper I will try to indicate some of the results and possible implications of three recently completed IEA studies in which the Netherlands participated. These studies were all conducted by members of the Department of Education at Twente University. Several national reports, articles and conference papers have been published. The IEA projects concerned are the Second International Study on Mathematics (SIMS), the Second International Study on Science (SISS), and the Classroom Environment Study (CES); the CES was divided into a correlational study (an IEA study) and an experimental study (not an IEA study). International reports for all three studies are underway. (At least five of our Institute's professional staff have been working on the publications that I have made use of in writing this paper, and I would like to take the opportunity of thanking them for this work).

The Dutch Educational System

There are two characteristics of the Dutch school system that should be mentioned if the research is to be understood. One is that secondary education is split up into at least four different streams, each almost isolated from the others in a different school type. There has been much political debate about changing the system and "going more comprehensive", but the different schooltype system is likely to exist for at least another decade.



At the grade levels at which our research took place - grades 8 and 9 - an important difference is between general education (mavo and havo/vwo), taking about 60% of the age group and junior vocational education (lhno and lbo) taking about 30% of the age group. (In one of the studies lbo was divided into lto or lower technical and lao, lower

agricultural). The higher type of general education, havo/vwo, gives access to the university and a number of professional schools. Havo/vwo differs from the other school types in terms of the number of years of study and in terms of the curriculum. Teachers in these schools are also better qualified and better paid. Many of them have Master's degrees in their subject. Lhno is mainly for girls and lbo mainly for boys, at least in our studies. The above school types exist work as separate institutions from the 7th grade onwards.

The second characteristic to be mentioned is that the Dutch system is centralized for funding and final examinations. In some ways, this national centra'ization prohibits any strong influence by local authorities but, at the same time, provides a certain freedom for individual schools. For example, each school has a certain freedom in terms of curriculum and choice of textbooks.

For our IEA research these two characteristics had their consequences for sampling, for data analysis and for the method of reporting. Data analysis and reporting were concerned with the effect and efficiency of teaching within different school types, and with the influence of the textbook as a variable. Effects of the opportunity to learn (OTL), and students' participation during class were measured using achievement test scores as the critirion. The design of the first experimental training for in service teachers in CES was influenced by the differences found between school types and between three different textbooks for mathematics.

Design of the 3 Studies

Sample and Data Collection for the Three Studies

Mathematics: The age group studied in the Mathematics (and Classroom Environment) study was defined as: all students in the grade level where the majority has attained the age of 13.00 - 13.11 by the middle of the school year. In the Netherlands this meant the second year of secondary school, or the equivalent of grade 8 in the USA. Using a stratified random sample of classes, the sample was drawn from all school types. These were 236 classes from 236 schools. The data were collected in 1982.

Science: The grade level studied in this project was the 9th grade. Again, using a stratified random sample of classes, a sample was drawn of 224 classes from 224 schools. The data were collected in 1984. Because of the test length (103 items) in science, multiple matrix sampling was used in such a way that each student took 61 items from 103.

Classroom Environment, the correlational study: The sample consisted of fifty 8th grade classes (and their teachers) from 17 schools (havo/vwo, preparing for university or other higher education). The teachers had masters degrees in mathematics. The sample contained equal numbers of users of the 3 main textbooks in use in the country. As the Classroom Environment Study tried to identify teaching practices associated with learning outcomes, eight observations per class were made between the beginning and end of the 1981-1982 school year.

Classroom Environment, the experiment: An experimental training program of 6 hours was designed on the basis of (a) the outcomes of the correlational study, (b) the results from similar studies, and (c) theoretical studies. One of the 3 main textbooks was selected and 9 teachers volunteered to participate in the course and study the 40 page manual. There were two main goals of the training: management behavior and instructional behavior. Classroom management was divided into: (a) the prevention of classroom disturbances, and (b) the restoration of classroom order. Three aspects of instructional behavior were trained: cues, questions and feedback, but in this paper only the use of examples and the type of questioning will be reported. The scoring of these teacher behaviors was done using the observation schedule from the correlational study. Effect sizes were calculated indicating the difference between pre- and postinstructional behavior measured on a Z-scale.

Results of the 3 Studies

Differences Between School Types

Table 1 presents the achievement scores in percentage form in mathematics and in science in the four major school types.

---Insert Table 1 here---

These percentage scores illustrate, yet again, the well known fact in The Netherlands that these four school types can be rank ordered according to student learning outcomes.

Differences Between Mathematics Textbooks

In the 50 schools in CES three series of mathematics textbooks were equally represented. One of the series, "Sigma", was selected for the experimental phase of CES. In the correlational phase of that study Krammer (1984, 1985) had found that there were four teaching practices that differed significantly between the three main math textbooks. Putting the SIGMA textbook at an index of 100, the two other books get the following values: Time spent on seatwork 155, 100; number of higher order questions 55, 93; discourse by or with students 50, 93; remedial help according to student's perception 99, 90. Number of items and average time spent on mathematics problems showed the values 70, 71 and 49, 82 respectively. Krammer further noted a difference between the three groups of users of the textbooks in terms of the correlations between their teaching practices and learning outcomes. Because of the large differences between books in terms of classroom variables only one textbook was used in the training (see below).

Opportunity to Learn and Achievement in Math and Science

In order to be able to compare better the results from the different countries, IEA makes use of two procedures. First, a careful curriculum analysis in all the countries precedes the construction of tests. Second, during data collection, the opportunity to learn (OTL) the content covered of all the items in the achievement test is measured. This measure is not only of interest in itself but can be used later to estimate and correct for test validity. Classroom teachers are asked to indicate for each item if they have taught the content covered by the item. In the math study teachers also indicated their estimate of the percentage correct answers for their class.

Opportunity to learn in Mathematics:

In the mathematics study, opportunity to learn was measured in two ways. There were 236 teachers who answered the two possible questions ("taught?" and "%correct?") pertaining to OTL for 40 core test items.

---Insert Table 2 here---

Estimated class score, (%correct), had a between class correlation of .77 with achievement. Judgement about teaching in the past showed differences between school types. It correlated zero with class average achievement scores in the two more academic oriented school types (havo/vwo and mavo) but .29 and .32 in the lower school types (lto and

lhno). The teacher's ability to predict performance (percentage correct) was related to his or her experience as a teacher: in havo/vwo negatively (r= -.27 p.02) and in mavo positively (r=.25 p.02).

Opportunity to Learn in Science

Opportunity to learn in science was measured through the question in the teacher's questionnaire if and when the content of this item was taught to this class. Ten Bruggencate, Pelgrum & Plomp (1986) found for the four different science subjects correlations with achievement from .14 (biology) to .69 (chemistry) for their total sample of classes. Within the schooltypes the correlations were lower and the strengths of half of the correlations were comparable to those in SIMS. Chemistry had the highest correlations, and both biology and geography differed per school type.

---Insert Table 3 here---

Aspects of Classroom Environment and Achievement

Table 3 presents the between class correlations between selected variables for teacher questioning behaviors and management variables with achievement.

The correlation within the group of 17 teachers using SIGMA, between "Time engaged in instruction and other task oriented activities," and achievement was .65, and with attitude it was .17. From Table 3 it appears that these correlations were lower if the different textbooks were taken together.

A Short Experimental In-service Training

The experimental training course was designed with the purpose of training teachers in those classroom practices strongly correlated with achievement or in those behaviors recommended in theoretical writings. After a short training session changes in teachers' behavior were measured, using data from CES on the experimental training as reported by Van der Sijde (1985). The effect sizes were as follows: (a) "Management preventive" (more) .67; (b) "management corrective" (less) .42; (c) using examples (more) 3.50; (d) higher order questioning (more) 1.13; (e) lower order questioning (less) -.35; (f) probing questions (more) .47.

Recommendations

All international projects in IEA offer participating countries the possibility of adding extra questions to instruments. This provides the participating countries with the opportunity of investigating old questions. In the Dutch history of IEA there are several examples of this. In this paper we dealt with hypotheses school types and about competing mathematics textbooks.

Based on the initial results from our first training course and the composite results from the three other studies, three recommendations for the conduct of teaching and the practice of teacher education can be offered.

(1) Train teachers in classroom practices which have high predictive values for student learning outcomes. This first recommendation is based on the fact that we found changes in teaching behaviors in the suggested and desired direction. It seemed possible to change teacher practices when teachers are voluntarily participating in a short course.

(2) Make teachers aware of the pecularities of the main textbooks and suggest appropriate adaptive classroom practices.

We concluded from the work of Krammer that there is evidence for the thesis that in the past the textbook has been neglected as a variable. Textbooks can make a difference. I once heard a leading teacher in our country say that an able teacher can teach from a calendar leaf. Some indeed seem to hold that teaching is mainly a question of inborn and developed capacities not dependent on learning material. Our findings may shatter this contention. Textbooks do make a difference. For teacher trainers it means that educational theory can be more specific about teacher behavior. At least that seems to be advisable in The Netherlands, where local or other authorities do not deal with the choice of the school's textbooks.

(3) Show teachers the different causal structure in different school types.

Finally we again found the expected differences in achievement between the school types in our country. School types make a difference. In this paper we did not explore the different phenomena we found, but the different authors in our group hold that we will be able to enlarge our

knowledge of the relationship between variables within the school types. Achievement differences between school types are not new. Twenty years ago, when Holland participated in the first Mathematics Study the well known difference in achievement between boys and girls was surpassed by the large differences between the mean scores of types of secondary schools (Warries, 1985), but now it is time that we search for the underlying causes governing these phenomena. And what we certainly have to do, is to teach our future teachers about what we already know.

Table 1: Mean Percentage Correct on the 74-item Math Achievement Test and on the 70 Item International Science Test

	vwo/havo	mavo	1to	1hno
Mathematics Achievement.....	78	60	47	36
Science Achievement.....	72	57	53	42

Table 2: Correlations between teachers' judgments about test percentage taught and class test score in five schooltypes and four science subjects.

	vwo/havo	mavo	1to	1hno	1ao	TOTAL
	N=50	N=50	N=55	N=45	N=24	N=224
Biology.....	.05	.12	-.13	.21	.03	.14
Physics.....	.00	.12	.18	-.01	.23	.40
Chemistry.....	.13	.40	.21	.39	.07	.69
Geology/geography.....	.10	.10	-.12	.23	.23	.31

Table 3: Correlations Between Classroom Environment Variables and Learning Outcomes, for 17 Teachers Using the SIGMA-textbook, and for all 50 Teachers

	ACHIEVEMENT		ATTITUDE	
	N=17	N=50	N=17	N=50
Questioning				
Posing lower-order questions.....	-.10	-.10	.36	-.02
Posing higher-order questions.....	.40	.21	.06	.04
Lower order question to whole class...	.40	.10	-.02	.00
Higher order question to whole class..	.38	.20	.02	.03
Redirecting succesfully.....	.42	.23	.48	.15
Management				
Control and discipline.....	-.54	-.33	-.09	-.14
Non-academic interactions in classroom	-.56	-.24	-.25	-.23
Teacher busy with management.....	-.69	-.24	-.26	-.23
Discipline comment (whole class).....	-.59	-.28	-.19	-.28
Discipline comment (one student).....	-.53	-.32	-.06	-.32
Active Participation				
Proportion of students on task.....	.65	.19	.17	.06

Literature

Bruggencate, G.C. ten; Pelgrum, W.J.; Plomp, Tj. (1986). Eerste resultaten van de Second IEA Science Study in Nederland. In W.J. Nijhof & E. Warries (Red.). De opbrengst van onderwijs en opleiding. Lisse: Swets & Zeitlinger.

Krammer, H.P.M. (1984) Leerboek en leraar. Doctoral dissertation, Twente University.

Krammer, Hein P.M. (1985). The Textbook as Classroom Context Variable. Teaching and Teacher Education, 1, 4, 273-278.

Pelgrum, W.J.; Eggen, Th.J.H.M.; Plomp, Tj. (1983). Tweede Wiskunde Projekt. Beschrijving van uitkomsten - Analyses van uitkomsten. (Two volumes of national report second Mathematics study). Enschede: Twente University.

Tomic, W. (1985) Docentgroep en leerresultaten. Docotoral Dissertation Twente University.

Van der Sijde, Peter (1985). The Implementation of a Research Based Teacher Training. Enschede: Toegepaste Onderwijskunde. Technische Hogeschool Twente.

Warries, Egbert (1985). The Outlook for International Evaluation. In B.P.M. Creemers (ed.) Evaluation Research in Education. The Hague: Foundation for Educational Research SVO.